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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR  | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|-----------------------|---------------------|------------------|
| 10/653,829      | 09/03/2003  | Alvin Stanley Cullick | 5460-01101          | 4127             |

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| EXAMINER |
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| ART UNIT | PAPER NUMBER |
|----------|--------------|

2128

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| MAIL DATE | DELIVERY MODE |
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08/03/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                       |  |
|------------------------------|--------------------------------------|---------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/653,829 | <b>Applicant(s)</b><br>CULLICK ET AL. |  |
|                              | <b>Examiner</b><br>Cuong V. Luu      | <b>Art Unit</b><br>2128               |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 May 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,7,9,10,13,15-21,23-25,27-31,42-45 and 49-53 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,7,9,10,13,15-21,23-25,27-31,42-45 and 49-53 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/12/09</u> .   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

Claims 1, 7, 9-10, 13, 15-21, 23-25, 27-31, 42, 45, and 49-53 are pending.

Claims 3, 12, and 44 have been canceled. Claim 50-53 has been added. Claims 1, 7, 9-10, 13, 15-21, 23-25, 27-31, 42, 45, and 49-53 have been examined. Claims 1, 7, 9-10, 13, 15-21, 23-25, 27-31, 42, 45, and 49-53 have been rejected.

### ***Response to Arguments***

1. The 35 USC 101 rejections of claims 13, 21, 31, 42, and 48 have been withdrawn in light of amendments to said claims.
2. Applicant's arguments with respect to claims 1, 7, 9-10, 13, 15-21, 23-25, 27-31, 42, 45, and 49-53 have been considered but are moot in view of the new ground(s) of rejection under U.S.C. 103(a).

### ***Claim Objections***

3. Claims 51 and 52 are objected for depending on canceled claim 3. To examiner claims 51 and 52, the Examiner assumes they are dependent on claim 1.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2128

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1, 13, 15-16, 49, and 51-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorell et al. (Trends in Reservoir Simulation: Big Models Scalable Models? Will you Please Make up Your Mind?, SPE 71596, SPE Annual Technical Conference and Exhibition, 9/2001), in view of Netemeyer et al. (U.S. Pub. 2002/0169785 A1).**

4. As per claim 1, Gorell teaches a method comprising:

a computer system receiving user input selecting one or more simulation engines corresponding to a value chain (p. 2 col. 2 first 3 bullets. In this paragraph Gorell teaches executing a simulation engine to run a simulation based on model which is built on parameters. A simulation starts only by a user's command, and a simulation model is built on parameters, which are regarded as a value chain. Therefore, Gorell's teaching reads onto this limitation);

the computer system assembling a set of models in a memory that represent components of a value chain, wherein each of the models of said set includes one or

Art Unit: 2128

more variables, where each of said one or more variables is defined on a corresponding range (p. 9 col. 2 section Economic Monte Carlo Simulation. In this section Gorell teaches running Monte Carlo simulation. Monte Carlo simulation inherently varies values of variables within selected ranges in one or more models and run simulation. This teaching, therefore, reads onto this feature), wherein at least one of the models of said set of models is a high-resolution geocellular reservoir model (p.2 col. 1 paragraph 4 and p.5 col. 1 paragraph 3 and p. 5 Table 2. In these cited paragraphs and Table, Gorell teaches using geocellular reservoir model with number of cells of maybe 125000. These teachings read onto a high-resolution geocellular reservoir model);

the computer system selecting values of the variables in their respective ranges to create instantiated models (p. 6 col. 2 last paragraph);

the computer system assembling the instantiated models into a workflow (pp. 5-6 section Identify Parameters);

the computer system executing one or more simulation engines on the workflow to generate data output, wherein said executing is performed on the computer (p. 2 col. 2 paragraph 3 including 6 bullets);

the computer system storing the selected values of the variables and the data output from the one or more simulation engines to a memory (p. 3 col. 2 last paragraph. In this paragraph Gorell teaches disk space associated with output information and attribute of models. This teaching reads onto this limitation);

the computer repeatedly performing said selecting, said assembling the instantiated models, said executing and said storing (p. 6 col. 1 sections 1<sup>st</sup> Iteration and 2<sup>nd</sup> Iteration);

Art Unit: 2128

the one or more simulation engines include including one or more physics-based reservoir flow simulators for simulating reservoir, wells (pp. 5-6 section Identify Parameters through 1<sup>st</sup> Iteration);

but does not teach:

simulating surface-pipeline hydraulics.

Netemeyer teaches one or more physics-based reservoir flow simulators for surface-pipeline hydraulics (p. 1 paragraphs 0002, 0005).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell and Netemeyer. Netemeyer's teachings would have provided been useful in simulating a reservoir system that extends the discretized reservoir simulation model beyond reservoir to include nodes and connection for modeling fluid flow in the well tubulars and surface production and gathering lines, separators and pipelines (Netemeyer, p. 2 paragraph 0025).

5. As per claim 13, these limitations have already been discussed in claim 1. They are, therefore, rejected for the same reasons.
6. As per claim 15, Gorell teaches the simulation engine including an economic computation engine (p. 10 col. 1 paragraph 1).
7. As per claim 16, Gorell teaches the input data set also includes a model of reservoir physical characteristics (pp. 5-6 section Identify Parameters. Several bullets in this section describe physical parameters for modeling a reservoir).

Art Unit: 2128

8. As per claim 49, Gorell teaches the data-output is useable to estimate reservoir (p. 2 paragraph 2).
9. As per claim 51, Gorell teaches said repeating covers all possible combinations of values of the variables in their respective ranges (p. 6 the paragraph immediately before section 2<sup>nd</sup> Iteration).
10. As per claim 52, Gorell teaches said repeatedly performing uses an experimental design algorithm to generate combinations of variable values in each iteration of said repeating (p. 4 col. 2 section Prototyping).

**Claim 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorell et al. in view of Netemeyer et al. as applied to claim 1 above and further in view of Voit et al. (Random Number Generation from Right-Skewed Symmetric, and Left-Skewed Distributions, 0272-4332/00/200-0059, 2000 Society for Risk Analysis).**

11. As per claim 7, Gorell and Netemeyer do not teach said selecting of values of the variables includes computing quantiles of one or more user-specified probability distributions. However, Voit teaches computing quantiles of one or more user-specified probability distributions (p. 61 col. 2 section 3. S-Distribution in Monte Carlo Simulation paragraph 1).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell, Netemeyer and Voit. Voit's teachings would have provided

Art Unit: 2128

access to uniformly distributed random numbers of sufficient quantity (p. 61 col. 2 section 3. S-Distribution in Monte Carlo Simulation paragraph 1).

12. As per claim 9, Gorell and Netemeyer do not teach said selecting of values of the variables includes choosing a value in a user-specified quantile range  $[Q_A, Q_B]$  based on a probability distribution specified by a user for a first one of the variables, wherein A and B are integers between zero and 100 inclusive.

However, Voit teaches this limitation (p. 62 col. 2 section 4. Error Estimation paragraphs 1-2. In these paragraphs Voit teaches estimation errors in quantiles between 1<sup>st</sup> and 99<sup>th</sup> and then an example of selecting a value for h and g parameters in the 98<sup>th</sup> quantile. The teaching of estimating errors in specified quantiles indicates the intention to select values of parameters in those quantiles, Illustrated in the example. Therefore, this teaching reads onto this limitation).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell, Netemeyer and Voit. Voit's teachings would have provided access to uniformly distributed random numbers of sufficient quantity (p. 61 col. 2 section 3. S-Distribution in Monte Carlo Simulation paragraph 1).

**Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gorell et al. in view of Netemeyer et al. and Voit et al.**

13. As per claim 10, Gorell teaches a computer-implemented method comprising:

a computer system receiving input specifying a user's selection of one or more simulation engines associated with a value chain (p. 2 col. 2 first 3 bullets. In this paragraph Gorell teaches executing a simulation engine to run a simulation based on

Art Unit: 2128

model which is built on parameters. A simulation starts only by a user's command, and a simulation model is built on parameters, which are regarded as a value chain.

Therefore, Gorell's teaching reads onto this limitation);

a computer system assembling a set of models in a memory that represent components of the value chain, wherein each of the models of said set includes one or more random variables (p. 9 col. 2 section Economic Monte Carlo Simulation. In this section Gorell teaches running Monte Carlo simulation. Monte Carlo simulation inherently varies values of variables within selected ranges in one or more models and run simulation. This teaching, therefore, reads onto this feature), wherein at least one of the models of the set of models is a high-resolution geocellular reservoir model (p.2 col. 1 paragraph 4 and p.5 col. 1 paragraph 3 and p. 5 Table 2. In these cited paragraphs and Table, Gorell teaches using geocellular reservoir model with number of cells of maybe 125000. These teachings read onto a high-resolution geocellular reservoir model);

a computer system instantiating the random variables of each model to determine instantiated models wherein said instantiating the random variables includes instantiating a value of a first one of the random variables (pp. 5-6 section Identify Parameters);

a computer system assembling the instantiated models into a workflow (pp. 5-6 section Identify Parameters);

a computer system executing the one or more simulation engines on the workflow to generate data output wherein said executing is performed on the computer (p. 2 col. 2 paragraph 3 including 6 bullets); and

a computer system storing the data output from the one or more simulation engines to a memory (p. 3 col. 2 last paragraph. In this paragraph Gorell teaches

Art Unit: 2128

disk space associated with output information and attribute of models. This teaching reads onto this limitation);

the computer repeatedly performing said selecting, said assembling the instantiated models, said executing and said storing (p. 6 col. 1 sections 1<sup>st</sup> Iteration and 2<sup>nd</sup> Iteration);

the one or more simulation engines include including one or more physics-based reservoir flow simulators for simulating reservoir, wells pp. 5-6 section Identify Parameters through 1<sup>st</sup> Iteration);

but does not teach:

simulating surface-pipeline hydraulics.

wherein said value is instantiated in a quantile range  $[Q_A, Q_B]$  based on a user-specified probability distribution and user-specified integers A and B which are between zero and 100 inclusive; and

wherein the one or more simulation engines include one or more physics-based flow simulators for simulating reservoirs, wells and surface-pipeline hydraulics.

Netemeyer teaches one or more physics-based reservoir flow simulators for surface-pipeline hydraulics (p. 1 paragraphs 0002, 0005).

Voit teaches said value is instantiated in a quantile range  $[Q_A, Q_B]$  based on a user-specified probability distribution and user-specified integers A and B which are between zero and 100 inclusive (p. 62 col. 2 section 4. Error Estimation paragraphs 1-2).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell, Netemeyer, and Voit. Netemeyer's and Voit's teachings would have provided been useful in simulating a reservoir system that extends the discretized reservoir simulation model beyond reservoir to include nodes and

Art Unit: 2128

connection for modeling fluid flow in the well tubulars and surface production and gathering lines, separators and pipelines (Netemeyer, p. 2 paragraph 0025) and provided access to uniformly distributed random numbers of sufficient quantity (Voit, p. 61 col. 2 section 3. S-Distribution in Monte Carlo Simulation paragraph 1).

**Claims 17-21, 25, and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorell in view of Netemeyer et al. (U.S. Pub. 2002/0169785 A1) and Jalali et al. (U.S. Pub. 2002/0177955 A1).**

14. As per claim 17, Gore teaches a system comprising:

- a memory storing program instructions and data (p. 2 col. 1 paragraph 4);
- a processor configured to read the program instructions from the memory, wherein the program instructions are executable by the processor (p. 2 col. 1 paragraph 4), the processor is operable to:
  - assemble a set of models, wherein each of the models of said set includes one or more variables, where each of said one or more variables is defined on a corresponding range (p. 9 col. 2 section Economic Monte Carlo Simulation. In this section Gorell teaches running Monte Carlo simulation. Monte Carlo simulation inherently varies values of variables within selected ranges in one or more models and run simulation. This teaching, therefore, reads onto this feature), wherein at least one of the models of said set of models is a high-resolution geocellular reservoir model (p.2 col. 1 paragraph 4 and p.5 col. 1 paragraph 3 and p. 5 Table 2. In these cited paragraphs and Table, Gorell teaches using geocellular reservoir model with number of cells of maybe 125000. These teachings read onto a high-resolution geocellular reservoir model);

Art Unit: 2128

select values of the variables in their respective ranges to create instantiated models (p. 6 col. 2 last paragraph);

assemble the instantiated models into a workflow (p. 6 col. 1 section Implementation paragraph 1); and

execute one or more simulation engines on the workflow (pp. 5-6 section Identify Parameters through 1<sup>st</sup> Iteration);

repeatedly perform said selecting, said assembling the instantiated models and the perforation locations, and said executing the one or more simulation engines (p. 6 col. 1 sections 1<sup>st</sup> Iteration and 2<sup>nd</sup> Iteration);

the one or more simulation engines include including one or more physics-based reservoir flow simulators for simulating reservoir, wells (pp. 5-6 section Identify Parameters through 1<sup>st</sup> Iteration);

but does not teach:

one of the one or more simulations engines simulating surface-pipeline hydraulics; and

execute a well-perforator program on one or more well plans included in the instantiated models in order to determine perforation locations for the one or more well plans.

Netemeyer teaches one or more physics-based reservoir flow simulators for surface-pipeline hydraulics (p. 1 paragraphs 0002, 0005).

Jalali teaches execute a well-perforator program on one or more well plans included in the instantiated models in order to determine perforation locations for the one or more well plans (p. 9 paragraphs 0107-0108).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell, Jalali, and Netemeyer. Netemeyer's and Jalali's teachings would

Art Unit: 2128

have been useful in simulating a reservoir system that extends the discretized reservoir simulation model beyond reservoir to include nodes and connection for modeling fluid flow in the well tubulars and surface production and gathering lines, separators and pipelines (Netemeyer, p. 2 paragraph 0025) and determined locations of perforation if needed (Jalali, p. 9 paragraph 0107).

15. As per claim 18, Gorell teaches storing data output from the one or more simulation engines to the memory (p. 3 col. 2 last paragraph).

16. As per claim 19, these limitations have already been discussed in claim 17. They are, therefore, rejected for the same reasons.

17. As per claim 20, these limitations have already been discussed in claim 18. They are, therefore, rejected for the same reasons.

18. As per claim 21, these limitations have already been discussed in claims 19 and 20. They are, therefore, rejected for the same reasons.

19. As per claim 25, Gorell teaches the simulation engine including an economic computation engine (p. 10 col. 1 paragraph 1).

20. As per claim 27, Gorell teaches said performing setup operations including receiving user input specifying execution qualifying data corresponding to the case (p. 9 col. 2 section Economic Monte Carlo Simulation. In this section Gorell teaches running Monte Carlo simulation. Monte Carlo simulation inherently varies values of variables

Art Unit: 2128

within selected ranges in one or more models and run simulation. This teaching, therefore, reads onto this feature).

21. As per claim 28, Gorell teaches the execution qualifying data includes a number of iterations of the calculation loop (p. 10 col. 1 second bullet).

22. As per claim 29, Gorell teaches the execution qualifying data includes a set of attainable values for each planning variable (p. 9 col. 2 section Economic Monte Carlo Simulation. In this section Gorell teaches running Monte Carlo simulation. Monte Carlo simulation inherently varies values of variables within selected ranges in one or more models and run simulation. This teaching, therefore, reads onto this feature).

23. As per claim 30, Gorell teaches the execution qualifying data include data characterizing probability distributions for one or more of the planning variables (p. 8 Figures 11-12. These figures describes the simulation over a range of variable inputs to create complete PDF of output. It means a range of data input for generation of PDF, probability distribution, so this range of data input to characterize PDF, so it reads onto this limitation).

**Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gorell in view of Netemeyer et al. and Jalali et al. as applied to claim 21 above, and further in view of Begg (Improving Investment Decision Using a Stochastic Integrated Asset Model, SPE 71414, SPE Annual Technical Conference and Exhibition, 9/2001) submitted by the Applicant in IDS.**

24. As per claim 23, Gorell does not teach said storing the instantiated planning variables and simulation output data onto the storage medium in a relational database format. However, Begg teaches storing data in a relational database format (p. 5 col. 1 paragraph 3).

**Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gorell in view of Netemeyer et al. and Jalali et al. as applied to claim 21 above, and further in view of Voit et al.**

25. As per claim 24, Gorell teaches said generating instantiations of the planning variables includes:

calculating a set of random numbers (p. 9 col. 2 section Economic Monte Carlo Simulation. In this section Gorell teaches running Monte Carlo simulation. Monte Carlo simulation inherently varies values of variables within selected ranges in one or more models and run simulation. This teaching suggests random variables),

but does not teach calculating quantile values using the random numbers and user-defined probability distributions associated with the planning variables.

Voit teaches computing this limitation (p. 61 col. 2 section 3. S-Distribution in Monte Carlo Simulation paragraph 1).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell, Netemeyer, Jalali, and Voit. Voit's teachings would have provided access to uniformly distributed random numbers of sufficient quantity (p. 61 col. 2 section 3. S-Distribution in Monte Carlo Simulation paragraph 1).

Art Unit: 2128

**Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Begg et al.**

26. As per claim 31, Gorell teaches a method comprising:

a computer system assembling a first case comprising a first set of models and planning variables for components of a value chain, in response to first user input (p. 5 section Upscaling and Validation), wherein the first set of models and planning variables includes at least one high-resolution geocellular reservoir model (p.2 col. 1 paragraph 4 and p.5 col. 1 paragraph 3 and p. 5 Table 2);

the computer system assembling a second case by receiving second user input specifying modifications to the first set of models and planning variables and modifying the first set of models and planning variables according to said second user input (p. 5 section Upscaling and Validation and p. 4 col. 2 second bullet);

the computer system storing the first case, the second case and the modifications to the first set of models and planning variables in a memory medium (p. 4 col. 2 second bullet. In this bullet Gorell teaches identifying parameters in a basic model to be varied and a way to specify the values will take based on the user. The teaching reads onto this limitation);

but does not teach:

the computer system displaying an indication of the first case, the second case, and a parent child relationship between the first case and the second case; and

the computer system conditionally displaying the modifications to the first set of models and planning variables in response to a user request.

Egyed teaches:

the computer system displaying an indication of the first case, the second case, and a parent child relationship between the first case and the second case (p. 124

Art Unit: 2128

col. 1 last paragraph through col. 2 last paragraph and through p. 125 col. 1 first paragraph. In these paragraphs Egyed teaches a graph showing parent-child relationship among scenarios. This teaching reads onto this limitation); and

Gorell does not teach the computer system conditionally displaying the modifications to the first set of models and planning variables in response to a user request. However, with the records of modifications and display capabilities from Gorell's teachings, one of ordinary skills in the art would have been able to perform conditionally displaying the modifications to the first set of models and planning variables in response to a user request. It would have provided capability to identify dependencies visually. Also, Egyed's teachings in combination with Gorell's would have provided information on what implications model elements on the parent's side might have onto their children (p. 129 col. 1 paragraph 1).

**Claims 42, 45, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorell et al. in view of Netemeyer et al., Jalali et al. (U.S. Pub. 2002/0177955 A1) and Begg et al.**

27. As per claim 42, Gorell teaches computer-implemented method comprising:

a computer system receiving user input characterizing probability distributions for planning variables associated with a set of models (p. 10 col. 1 paragraph 1 and first 3 bullets), wherein the set of models includes one or more high-resolution geocellular reservoir models (p.2 col. 1 paragraph 4 and p.5 col. 1 paragraph 3 and p. 5 Table 2);

the computer system generating instantiated values of the planning variables (p. 6 col. 2 last paragraph);

the computer system assembling one or more input data sets for one or more simulation engines from the set of models and the instantiated values (p. 9 col. 2 section Economic Monte Carlo Simulation);

the computer system executing the one or more simulation engines on the one or more input data sets (p. 2 col. 2 paragraph 3 including 6 bullets); and

the computer system storing the instantiated values of the planning variables and data output from the one or more simulation engines to a storage medium (p. 3 col. 2 last paragraph);

wherein the one or more simulation engines include one or more physics-based flow simulators for simulating reservoirs, wells (pp. 5-6 section Identify Parameters through 1<sup>st</sup> Iteration);

but does not teach:

wherein said assembling includes resolving uncertain event dates in one or more schedules included in the set of models based on a first subset of the instantiated values;

the computer system executing a well perforator program based on a second subset of the set of models and a second subset of the instantiated values;

wherein the one or more simulation engines include one or more physics-based flow simulators for simulating surface-pipeline hydraulics.

Netemeyer teaches at least one of the one or more simulations engines including one or more physics-based reservoir flow simulators for simulating surface-pipeline hydraulics (p. 1 paragraphs 0002, 0005).

Begg teaches said assembling includes resolving uncertain event dates in one or more schedules included in the set of models based on a first subset of the instantiated values (p. 3 col. 2 paragraph 3 from the bottom. This paragraph

Art Unit: 2128

describes estimating timing for development plan models and also providing timing for production. This teaching is regarded as reading onto this limitation)

Jalali teaches automatically execute a well-perforator program on one or more well plans included in the instantiated models in order to determine perforation locations for the one or more well plans (p. 9 paragraphs 0107-0108).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell, Netemeyer, Begg, and Jalali. Beggs', Netemeyer's and Jalali's teachings would have provided been useful in simulating a reservoir system that extends the discretized reservoir simulation model beyond reservoir to include nodes and connection for modeling fluid flow in the well tubulars and surface production and gathering lines, separators and pipelines (Netemeyer, p. 2 paragraph 0025) and determined locations of perforation if needed (Jalali, p. 9 paragraph 0107) and reduced uncertainty (p. 2 col. 2 2<sup>nd</sup> bullet from bottom).

28. As per claim 45, Gorell teaches executing a reservoir model-scaling engine to scale one or more high-resolution geocellular reservoir models of said set of models to a lower resolution (p. 5 col. 1 section Upscaling and Validation).

29. As per claim 48, Gorell teaches :

a computer system receiving user input characterizing a set of planning variables associated with a set of models (p. 2 col. 2 first 3 bullets);

the computer system generating instantiated values of the planning variables (p. 6 col. 2 last paragraph);

the computer system assembling a first input data set using a first subset of the instantiated values and a first subset of the set of models (p. 5 section Upscaling and

Art Unit: 2128

Validation), and assembling a second input data set using a second subset of the instantiated values and a second subset of the set of models (p. 5 section Upscaling and Validation and p. 4 col. 2 second bullet), wherein the first subset of the set of models includes a high-resolution geocellular reservoir model (p.2 col. 1 paragraph 4 and p.5 col. 1 paragraph 3 and p. 5 Table 2);

the computer system executing one or more physics-based flow simulators on the first input data set to generate flow data for oil, gas and water (p. 2 col. 1 paragraph 4 and p. 5 col. 1 last paragraph through p.5 first paragraph) wherein the one or more physics-based flow simulators are configured to simulate reservoirs, wells (pp. 5-6 section Identify Parameters through 1<sup>st</sup> Iteration);

executing an economic computation engine on the second input data set to generate economic output data (p. 10 col. 1 paragraph 1);

storing the instantiated values of the planning variables, the flow data and the economic output data to a storage medium (p. 3 col. 2 last paragraph); and

repeating steps until a termination condition is achieved (p. 10 col. 1 second bullet).

Gorell does not teach:

storing data in a relational database format;

appending the flow data to the second input data set (p. 5 col. 1 paragraph 2 and col. 2 section Generating Simple Surrogates)

the computer system determining instantiated schedules using a third subset of the instantiated values and a third subset of the models, and appending the instantiated schedules to the first input data set and the second input data set;

executing a well-perforator program to determine well perforation locations for wells in the first input data set, and appending the well perforation locations to the first input data set;

the one or more physics-based flow simulators are configured to simulate surface-pipeline hydraulics;

Jalali teaches limitation executing a well-perforator program to determine well perforation locations for wells in the first input data set, and appending the well perforation locations to the first input data set (p. 9 paragraphs 0107-0108);

Begg teaches:

storing data in a relational database format (p. 5 col. 1 paragraph 3);

appending the flow data to the second input data set (p. 5 col. 1 paragraph 2 and col. 2 section Generating Simple Surrogates);

the computer system determining instantiated schedules using a third subset of the instantiated values and a third subset of the models, and appending the instantiated schedules to the first input data set and the second input data set (p. 5 col. 1 paragraph 2. In this paragraph Begg teaches using a model to calibrate the SIAM component models, estimate uncertainty in their input parameters. This teaching reads onto this limitation);

Netemeyer teaches at least one of the one or more simulations engines including one or more physics-based reservoir flow simulators for simulating surface-pipeline hydraulics (p. 1 paragraphs 0002, 0005).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell, Beggs, Jalali, and Netemeyer. Netemeyer's and Jalali's teachings would have been useful in simulating a reservoir system that extends the discretized reservoir simulation model beyond reservoir to include nodes and

Art Unit: 2128

connection for modeling fluid flow in the well tubulars and surface production and gathering lines, separators and pipelines (Netemeyer, p. 2 paragraph 0025) and determined optimum segmentation for the well (Jalali, p. 9 paragraph 0107) and calibrated component models (Begg, p. 5 col. 1 paragraph 2 to improve the fidelity of the models representing the real world).

**Claims 50 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorell, in view of Netemeyer et al. (U.S. Pub. 2002/0169785 A1) as applied to claim 1 and 13 above, and further in view of Joshi et al. (Techno—Economic and Risk Evaluation of a Thermal Recovery Project, March 1996, Prepared for Department of Energy, Under Contract DE-FG22-93BC14899).**

30. As per claim 50, Gorell and Netemeyer do not teach selecting of values of the variables is based on a Latin Hypercube sampling of the variables. However, Joshi teaches this limitation (pp. xlv, paragraph 4; p. xlv, paragraph 2).

It would have been obvious to one of ordinary skill in the art to combine the teachings of Gorell, Netemeyer, and Joshi. Joshi's teachings would have accurately re-created an input distribution in less iteration, as compared to Monte-Carlo sampling (Joshi, paragraph 4; p. xlv, paragraph 2).

31. As per claim 53, this limitation has already been discussed in claim 50. It is, therefore, rejected for the same reasons.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cuong V. Luu whose telephone number is 571-272-8572. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah, can be reached on 571-272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. An inquiry of a general nature or relating to the status of this application should be directed to the TC2100 Group receptionist: 571-272-2100.

Art Unit: 2128

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**/Cuong V Luu/**

**Examiner, Art Unit 2128**

**/Hugh Jones/**

**Primary Examiner, Art Unit 2128**